THURSDAY, JANUARY 6, 1881

DR. GÜNTHER ON FISHES

An Introduction to the Study of Fishes. By Albert C. L. G. Günther, M.A., M.D., Ph.D., F.R.S., Keeper of the Zoological Department in the British Museum. (Edinburgh: A. and C. Black, 1880.)

A GENERAL work on Fishes could not have been undertaken by a more thoroughly qualified writer than Dr. Günther. Twenty years ago and more he commenced studying the collection of this ever-interesting and most important group in the vaults of the British Museum, with what success let not only the present fine collection of fish in the National Museum declare, but also that truly wonderful work, to be the product of one man's labours, "The Catalogue of Fishes," in eight volumes, published by order of the Trustees of the British Museum. Fishes have always been a subject of great interest to mankind; their commercial value interests some, others, as keen sportsmen, could not exist without their finny prey; from the earliest times, and among the earliest records, we find them of importance as articles of food. To the man of science, be he or be he not a specialist, fishes are of an ever-increasing interest, placed at the very beginning of vertebrate life, and by their study we seem to see more clearly into the evolution of that life which culminated in the production of ourselves.

A book to tell us in carefully selected generalities all about fishes: such the English reader had no access to, until the publication of this volume. If it come not up to a perfect standard how could it be otherwise, for had not the history of the structure of fish, their habits, their distribution, their classification to be condensed within the limit of a few hundred pages, and the wonder is that so much will be found here given, not that a few things have been left unnoticed or but partially touched upon. We have looked over each page of the handsomely got-up, well-printed, and well-illustrated volume, and we feel certain that it must find a place on the shelf of all biologists, and that it will find a place in the libraries also of that vastly larger class, the intelligent general reader.

The first and slightly smaller half of the volume treats of fishes in general; the second half of fishes from a systematic and descriptive point of view. The work opens with an account of the history and literature of the subject beginning with Aristotle; who had a perfect knowledge of the general structure of fish, and who wrote about them some three and a half centuries before the Christian era; which account is continued to the most recent times; the work done by Ray, Artedi, Linneus, Bloch, Lacépède, Cuvier, Agassiz, Müller, being passed in review. The next twelve chapters treat of the external morphology of fish and of their internal structure. We would have liked more details about the recent researches into the modifications to be met with in fishes' tails; the description of the electrical organs to be met with in some fish is far too brief; the myology of fishes is dismissed with a little over a page, as if it were not a favourite subject with the author, and yet it is one worth working at and by no means deficient in promise. In the chapter on Respiration the subject of the temperature in fishes is scarcely alluded to; the chapter on the Reproductive Instincts of Fish is sure to interest the readers, some of whom may learn for the first time of female fishes taking care of their progeny, and more curious, of male fishes doing the same. The chapter on the Growth and Variation of Fishes is well illustrated by woodcuts of some remarkable changes of form in fish. The fourteenth chapter treats of domesticated and acclimatised fishes, on the artificial impregnation of ova, tenacity of life and reproduction of lost parts, hybernation in fishes (a misuse of this term), useful and poisonous fishes. The uses of fishes to man our author disposes of in twelve lines, and it would almost seem as if he would rather not have referred to such a subject at all in the scientific part of this treatise. In these twelve lines we find the following:—"In the Polar regions *especially* whole tribes are *entirely* dependent on this class for subsistence." Without venturing on criticism we would ask, Is this so? Do the inhabitants of the Polar regions support their life wholly on fish, or are they not indebted for a large portion of their heat-producing food to the flesh or blubber of mammals? and do not the inhabitants of tropical countries, on the contrary, manage often to support their existence almost entirely on fish food?

While the chapters concerning the distribution of fishes in time leave a good deal to be desired, those on the distribution of fishes in space are most excellent; that on the fishes of the deep sea contains a complete list of deep-sea forms with the depths as ascertained by the dredgings of the *Challenger*, which list contains apparently over 100 species. Before the voyage of the *Challenger* scarcely thirty deep-sea fishes were known. Though this number has been now so very much increased yet no new types of families have been discovered. Perfectly novel and very interesting modifications of certain organs have been met with, but nothing more than what might have been expected from our previous knowledge of the group. The greatest depth reached hitherto by a dredge in which fishes were inclosed is 2900 fathoms; but the specimens then obtained belong to a species (*Gonostoma microdon*), which would seem to be extremely abundant in the upper strata of the Atlantic and Pacific Oceans, and were very probably caught by the dredge in its ascent. The next greatest depth, 2750 fathoms, must be accepted as one at which fishes undoubtedly do live. The fish obtained at this depth in the Atlantic, *Bathyophis ferox*, showing by its whole habit that it is a form living on the bottom of the ocean.

"The fish fauna of the deep sea," writes Dr. Günther, "is composed chiefly of forms or modifications of forms which we find represented at the surface in the cold or temperate zones, or which appear as nocturnal pelagic forms." The Chondropterygians are few in number, not descending to a depth of more than 600 fathoms. The Acanthopterygians, which form the majority of the coast and surface faunas, are also scantily represented; genera identical with surface types are confined to the same inconsiderable depths as the Chondropterygians, while those Acanthopterygians which are so much specialised for the life in the deep sea as to deserve generic separation, range from 200 to 2400 fathoms. Three distinct families belong to the deep sea fauna, viz. Trachypteridæ, Lophotidæ, and Notacanthidæ; they respectively consist of three, one, and two genera. Gadidæ, Ophidiidæ, and Macruridæ are very numerous, ranging through all depths; they constitute about one-fourth of the whole deep-sea fauna. Of Physostomi, the families of Sternoptychidæ, Scopelidæ, Stomiatidæ, Salmonidæ, Bathythrissidæ, Alepocephalidæ, Halosauridæ, and Muraenidæ are represented. Of these the Scopeloids are the most numerous, constituting nearly another fourth of the fauna. Salmonidæ are scarce, with three small genera only. Bathythrissidæ includes one species only, which is probably confined in its vertical as well as horizontal range: it (*Bathythrissa dorsalis*) occurs at a depth of about 350 fathoms in the sea of Japan. The Alepocephalidæ and Halosauridæ, known before the *Challenger* Expedition from isolated examples only, prove to be true, widely spread, deep-sea types. Eels are well represented, and seem to descend to the greatest depths; Myxine has been obtained from a depth of 345 fathoms.

In the systematic portion Dr. Günther divides the class of fishes into four sub-classes—the first Palæichthyes, the second Teleostei, the third Cyclostomata, and the fourth Leptocardii. The description of each order, sub-order, and family is given. In addition we have the diagnosis of all the more important genera, and under these are given the names of the species of economic value or special scientific interest. We select the following account of two interesting genera as examples taken from the eighth family of the sharks, Spinacedæ:—

"ACANTHIAS.—Each dorsal fin with a spine. Teeth equal in both jaws, rather small; their point is so much turned aside that the inner margin of the tooth forms the cutting edge. Spiracles rather wide, immediately behind the eye.

"The two species of 'Spiny Dog Fishes,' *A. vulgaris* and *A. Blainvillii*, have a very remarkable distribution, being found in the temperate seas of the Northern and Southern Hemispheres, but not in the intermediate tropical zone. They are of small size, but occur at times in incredible numbers, as many as 20,000 having been taken in one season on the Cornish coast. They do much injury to the fishermen by cutting their lines and carrying off their hooks.

"CENTROPHORUS.—Each dorsal fin with a spine, which however is sometimes so small as to be hidden below the skin; mouth wide; teeth of the lower jaw with the point more or less inclined backwards and outwards; upper teeth erect, triangular, or narrow, lanceolate with a single cusp; spiracles wide, behind the eye.

"Eight species are known from the southern parts of the European seas and one from the Moluccas; they do not appear to exceed a length of five feet. According to the observations of E. P. Wright some of the species at least live at a considerable depth, perhaps at a greater depth than any of the other known sharks. The Portuguese fishermen fish for them in 400 to 500 fathoms with a line of some 600 fathoms in length. The sharks caught were specimens of *Centrophorus cœlolepis*, from three to four feet long; the sharks as they were hauled into the boat fell down into it like so many dead pigs, there was not the smallest motion of their bodies. There can be no reasonable doubt that they were inhabitants of the same great depth as Hyalonema; and that in fact they were killed by being dragged to the surface from the pressure of water under which they lived. The dermal productions of some of the species have a very peculiar form, being leaf-shaped, pedunculate, or ribbed or fronded with an impression."

One other quotation must suffice; the Clupeidæ forms the twenty-second family of the Physostomii, which is the fourth order of the second sub-class; after enumerating several genera, among them Engraulis, to which the Anchovy belongs, the hint being given that "lucrative fisheries of Anchovies might be established in Tasmania, where the same species occurs, in Chili, China, Japan, California, at Buenos Ayres, each of which countries possesses Anchovies by no means inferior to the Mediterranean species;" the author proceeds to give the particulars of the genus Clapea. After the scientific description he adds:—

"This genus comprises more than sixty different species The majority are of greater or less utility to man, but a few tropical species (*C. thrissa*, *C. venenosa*, and others) acquire probably from their food highly poisonous properties so as to endanger the life of persons eating them. The most noteworthy species are:—

"1. *C. harengus* (the 'Herring'). It is readily recognised by having an ovate patch of very small teeth on the vomer. Gill cover smooth without radiating ridges. It inhabits in incredible numbers the German Ocean, the northern parts of the Atlantic, and the seas north of Asia. The herring of the Atlantic coasts of North America is identical with that of Europe. A second species has been supposed to exist on the British coast (*C. Leachii*), but it comprises only individuals of a smaller size, the produce of a late or early spawn. Also the so-called 'Whitebait' is not a distinct species, but consists chiefly of the fry or the young of herrings, and is obtained 'in perfection' at localities where these small fishes find an abundance of food, as in the estuary of the Thames.

"2. *C. mirabilis*. The herring of the North Pacific.

"3. *C. sprattus*. The 'sprat,' without vomerine teeth. Gill cover smooth, without radiating ridges. Abundant on the Atlantic coasts of Europe.

"4. *C. thrissa*. One of the most common West Indian fishes, distinguished by the last dorsal ray being prolonged into a filament. Hyrtl has discovered a small accessory branchial organ in this species.

"5. *C. alosa*. The 'shad' or 'Allice shad,' with very fine and long gill-rakers, from sixty to eighty on the horizontal part of the outer branchial arch, and with one or more black lateral blotches. Coasts of Europe, ascending rivers.

"6. *C. finta*. The 'shad' or 'Twaite shad,' with stout osseous gill-rakers from twenty one to twenty-seven on the horizontal part of the outer branchial arch, and spotted like the preceding species. Coasts of Europe, ascending rivers and found in abundance in the Nile.

"7. *C. menhaden*. The 'mossbanker,' common on the Atlantic coasts of the United States. The economic value of this fish is surpassed in America only by that of the Gadoids, and is derived chiefly from its use as bait for other fishes and from the oil extracted from it, the annual yield of the latter exceeding that of the whale (from American fisheries). The refuse of the oil factories supplies a material of much value for artificial manures.

"8. *C. sapidissima*. The American shad, abundant and an important food-fish on the Atlantic coasts of North America. Spawns in fresh water.

"9. *C. mattowocca*. The 'Gaspereau' or 'Ale-wife,' common on the Atlantic coasts of North America, ascending into fresh water in early spring and spawning in ponds and lakes.

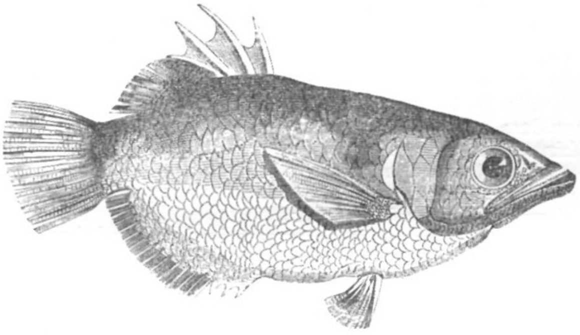
"10. *C. pilchardus*. The 'Pilchard' or the 'Sardine,' equally abundant in the British Channel, on the coast of Portugal, and in the Mediterranean, and readily recognised by radiating ridges on the operculum, descending towards the sub-operculum.

"11. *C. sagax*. Representing the Pilchard in the Pacific, and found in equally large shoals on the coasts of California, Chili, New Zealand, and Japan.

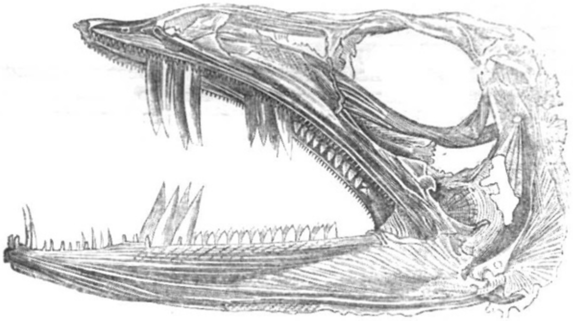
"12. *C. toli*. The subject of a very extensive fishery on the coast of Sumatra for the sake of its roes, which are salted and exported to China, the dried fish themselves being sent into the interior of the island. The fish is called 'Trubu' by the Malays, is about eighteen inches long, and it is said that between fourteen and fifteen millions are caught annually.

"13. *C. scombrina*. The 'oil sardine' of the eastern coast of the Indian Peninsula."[1]

These quotations will show the value and importance as well as the interest of the systematic and descriptive part of this volume, not a page of which is without some lines of most instructive reading, in many cases sufficiently so as to tempt one to turn "Ichthyologist" on the spot. We strongly recommend the reader to turn at once to the pages on the Salmonidæ. This portion too is illustrated with many excellent figures, two of which, through the courtesy of the publishers, we are permitted to reproduce —the first is of a fish belonging to the genus Toxotes. Two species of this genus are known from the East Indies, one of which (*T. jaculator*) is the more common, and it ranges to the north coast of Australia. It has received its name from its habit of squirting a drop of water at an insect which it perceives close to the surface in order to make it fall into it. The Malays, who call it "Ikan sumpit," keep it in a bowl in order to witness this singular habit, which it continues even in captivity.



Toxotes jaculator.



Skull of *Plagyodus ferox*.

The second woodcut represents the bones of the head of one of the largest and most formidable of the deep-sea fishes. Of the genus Plagyodus but one species is known (*P. ferox*). It has been found off Madeira and in the sea off Tasmania. Other species have been noticed from Cuba and from the North Pacific, but it is doubtful if they differ specifically from *P. ferox*. The fish grows to a length of six feet, and from the stomach of one specimen have been taken several eight-armed cuttle-fish, Crustacea, Ascidians, a young brama, twelve young boar fishes, a horse-mackerel, and one young of its own species. The stomach is coëcal, the commencement of the intestine has extremely thick walls, its inner surface being cellular, like the lung of a reptile, it has no pyloric appendage. All the bones are extremely thin, light, and flexible, containing very little earthy matter. Very singular is the development of a system of abdominal ribs symmetrically arranged on both sides and extending the whole length of the abdomen. Perfect specimens are rarely obtained on account of the want of coherence of the muscular and osseous parts, caused by the diminution of pressure when the fish reaches the surface of the water. The exact depth at which *Plagyodus ferox* lives is not known; probably it never rises above a depth of 300 fathoms; but woe betide any rash intruder that dares to descend into the realms of its abyss.

The volume closes with some directions for collecting and preserving fishes—when practicable fishes when dead should be set to swim in spirit. But we must not quote any more, so leave the curious reader to find out the details of how, having caught his fish, he can cook it so as to make it of value for some national museum.

SULPHURIC ACID AND ALKALI

A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches. By George Lunge, Ph.D., F.R.S.E., Professor of Technical Chemistry at the Federal Polytechnic School, Zurich (formerly manager of the Tyne Alkali Works, South Shields). Vol. III. (J. Van Voorst, 1880.)

THE publication of the third and concluding volume of Prof. Lunge's excellent work follows wonderfully soon on that of the first and second. This volume, which fully equals the other two in accuracy of description and clearness of style, is devoted to the subsidiary processes lying alongside of the main channel of Leblanc's great discovery. We first find a chapter on the ammoniacal soda process now rising, through Solvay's exertions, into well-merited and formidable competition with its older rival. The ash made by this theoretically beautifully simple and practically most original process is very pure, containing from 98 to 99 per cent. of Na_2CO_3, and free of course from the impurities common to Leblanc's ash of caustic soda and sulphide of sodium.

But this Solvay's ash is less dense than that made by the old plan, and both German and English manufacturers are now making a Leblanc ash of 98 per cent. free from sulphur and of a dense quality. The struggle, says Lunge, is not now one of purity, but merely of price, and so far Leblanc soda is holding its own. Here however the beneficial action of competition is seen: if Messrs. Brunner, Mond, and Co., of Northwich and Sandbach, were not turning out from 35 to 40 tons of Solvay ash *per diem*, I cannot help thinking that the Leblanc soda-makers might have felt inclined to rest content with their previous performances. There is of course no chance of this new process turning out the old-fashioned plan until the chlorine of the common salt can by this new method

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[1] In this quotation the fin formulæ and references to works on the Herring, &c., are omitted.